

# NEWSLINE

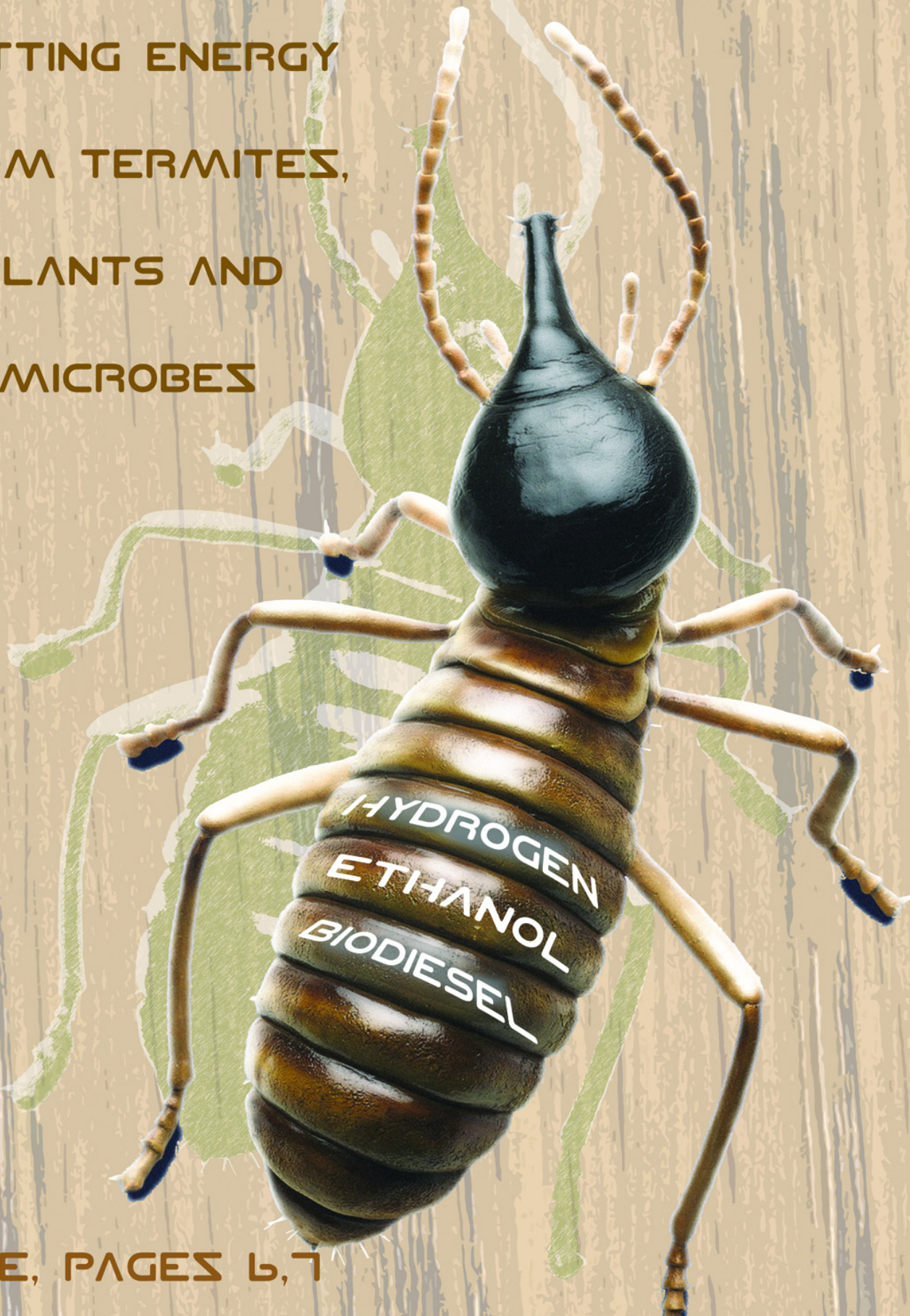
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## THE ENERGY BUG

GETTING ENERGY  
FROM TERMITES,  
PLANTS AND  
MICROBES



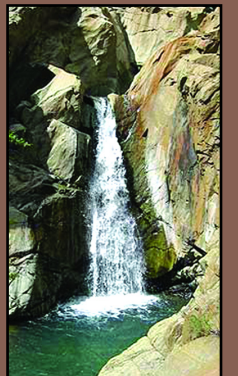
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### WHAT'S INSIDE



WAYNE'S WORLD  
REVISITED

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CHANGING FLOW  
OF GLOBAL  
WARMING

PAGE 8



POSTDOCS ARE  
VITAL TO LAB'S  
FUTURE

PAGE 9



SECURITY UPDATES

Security Department scales down services



BY RUSS MILLER  
SECURITY DEPARTMENT HEAD

There'd be little news value if I told Lab employees that the Security Department will experience budget cuts in FY'06 and FY'07, because nearly every organization on site finds itself under the same circumstances.

However, with our department facing a nearly \$10-million reduction in funding, nearly all Lab employees will feel the impact of changes required for us to function within these financial constraints. There are multiple causes for the budget reduction, including other sites within the complex that have been determined as having greater needs for security funding than Livermore.

Like other Lab organizations, we've trimmed or eliminated travel budgets, shelved plans for growth or expansions, and instituted hiring freezes that leave job vacancies unfilled. Despite such cutbacks, we're forced into additional cost-reduction measures.

Because our principal function of protecting vital Laboratory assets cannot change, the services that we offer to employees must change.

Unfortunately our FY'06 operations will see noticeable reductions in staffing, office hours, gate openings, and badge office operations. The greatest employee impact will fall upon those with last minute requests for the badge office or for clearance transfers.

Recognizing that special nuclear materials require the highest protection priority, Site 300 will experience resource reductions to maintain our protection strategy at the main site.

**Livermore Site Changes**

- Effective Wednesday, March 1, Westgate Badge Office will be open daily from 7 a.m. until 3 p.m. a reduction of nearly two hours per day. This solution reduces costly overtime and is necessary to complete badge office administrative tasks required by DOE orders. This solution presents no greater customer inconvenience when compared with the alternative of maintaining the current hours, but at reduced service levels.
- Starting that same date, limited area Post 3B (3rd St. at Ave. B, near Bldg. 131) will close permanently, leaving only two limited-area access points, near opposite ends of 1st St. Security Police Officers formerly assigned to Post 3B will be reassigned to support protection of special nuclear materials.
- Last month, TESA Production System



JACQUELINE MCBRIDE/NEWSLINE

Among budget cutbacks enacted by the Security Department is the permanent closure of Post 3B for access to the limited area on 3rd St. at Ave. B, near Bldg. 131.

hours at Locks & Keys changed to 7 a.m.-1 p.m. for workstation activities and encoding employee badges. Locks, Keys and Tessa Group also will close monthly at 3 p.m. on the last Thursday only, and will be available then only for emergencies.

- One somewhat brighter note is that employees may pass through South Main and Southwest gates without the redundant badge checks that have been conducted there by Lab security police officers. Sandia personnel will continue badge checks at both entrances to the East Avenue Security Corridor.
- Response by the Office of Classification and Export Control to requests for classification and export control determinations will slow. And development of new or updated classification guides will be delayed.
- Beginning March 1, Central Clearance Group will reduce operating hours to 1-4:30 p.m. on Wednesdays, and to 8 a.m. -4:30 p.m. on other weekdays, with daily lunchtime closure from noon to 1 p.m. The shutdown is necessary to allow completion of administrative work required by DOE orders.
- A staffing reduction in on-call alarm technicians will likely produce delayed after-hour response.

**Site 300 changes**

- The Site 300 Badge Office had been slated to close permanently effective March 1. Just before press time, closure was forestalled indefinitely when DNT agreed to fund this operation.
- The Central Alarm Station (CAS) and dispatch center will close permanently on March 1, with its functions transferred to the Livermore-site CAS.
- SPO staffing at Site 300 will be reduced.

I wish I could paint a rosier picture for FY'07, but for the Security Department, next year's outlook is more of the same. While these changes may result in some employee and public inconveniences, I can assure our employees, our sponsors, our neighbors and our community that we remain a highly professional organization, and that there will no reduction in the security of vital Laboratory assets.

Both the Safeguards and Security Organization and the Security Department continue to work closely with Laboratory organizations through the Program Security Representatives, as well as with the Directorate Safeguards and Security Officers, to prioritize resources during this transition.

New Nevada Test Site badging and entry requirements

New access requirements for the Nevada Test Site will go into effect March 1 for Laboratory employees on assignment at the test site.

Any Lab employee needing regular access to the Nevada Test Site (NTS) will need a NTS access badge in addition to their DOE/NNSA badge. To obtain an access badge, employees will need to complete the NTS Access Safety Orientation.

The NTS access badge is worn horizontally behind the DOE/NNSA badge (see photo). One side of the badge confirms that the bearer has received the

required safety orientation and understands the conditions required for NTS entry. The reverse side provides contact phone numbers for: emergencies; permission to enter controlled access areas; and assistance for non-emergencies.

Visitors requiring only temporary or one-time access to NTS do not need to take the Access Safety Orientation. Instead, they will be given a reference brochure which they must carry with them at all times while on site. The brochure, which can be folded to fit in a wallet, covers key safety points and

provides contact phone numbers and a map of NTS.

Laboratory employees are also reminded that when visiting NTS, they should bring their DOE/NNSA badge, but leave their LLNL dosimeters at home. NTS issues its own dosimeters to visitors on assignment in Nevada.

The NTS Access Safety Orientation is being offered at the Laboratory on an as needed basis for employees who regularly visit the test site. For information or to sign up for the one-hour orientation, contact the Nevada Experiments and Operations Program Office at 3-2835.



IN PROFILE

Wayne Shotts reflects on breadth of Lab career

By Stephen Wampler  
Newsline staff writer

Wayne Shotts is a "national treasure." At least that's what Linton Brooks, NNSA administrator and a couple hundred of Wayne's closest colleagues believe.

Shotts, the deputy director of Operations, is putting the finishing touches on a long and distinguished Lab career that spans nearly 32 years. March 1 marks the end of his tenure, a run that has seen multiple careers within the bounds of one scientific institution.

"When Wayne walks out of the Laboratory, the values, intellectual accomplishments and his commitments to the mission, science and the country will live on in the people who are in this room and the people who are in the Laboratory," Brooks said during Shotts' retirement party held earlier this month.

Brooks, and 200 of Wayne's family members, friends and colleagues were on hand recently to celebrate Shotts' career. Brooks presented Shotts with the NNSA's highest honor, the Gold Award, given previously to Edward Teller, Bruce Tarter and Bob Kuckuck, among others. Shotts' award reads "for distinguished service to the national security of the United States of America." But it was Brooks' two-word summary of Shotts earlier in the day, during an all-hands presentation by the administrator, that has Shotts feeling honored: "national treasure."

Shotts makes it clear he considers it his honor to work at the Lab rather than anyone feeling honored by his efforts.

"It's been just fantastic to work here," Shotts said. "I couldn't imagine a better place to work. Where else could you have the diversity and breadth of career opportunities?"

"Throughout his career, Wayne has used his wide range of talents as a first-class scientist and a strategic leader to do great things for the Laboratory," said Lab Director and LANL Director-designate Michael Anastasio, who flew from Los Alamos to attend Shotts' celebration. "It has been Wayne's passion for mission that we have appreciated so much. I think the Lab's 50th anniversary motto, 'Making History, Making a Difference,' appropriately reflects Wayne and his Laboratory career."

Shotts came to the Lab in 1974 and can count at least 10 different careers during his tenure. But there are three that he is particularly proud of: working for about 20 years in various aspects of nuclear weapons development, then heading the Lab's efforts to counter the threat of terrorism, and most recently, deputy

director for Operations.

In his first career, Shotts joined the Laboratory's A Division as a physicist in June 1974 after receiving his Ph.D. from Cornell University in 1973 and working as a researcher for E.I. dePont de Nemours & Company in Delaware.

Livermore made an impression on Shotts from his first interview as a young scientist. "It was a place where there was almost an insatiable curiosity about things. There was also a national prominence — the Lab was addressing important problems; it was in the press and it was in the news."

Additionally, Shotts had family members in California — which helped draw him westward. And, as Shotts laughed, "the weather isn't bad either."

A number of Shotts' fellow Cornell students also emigrated to Livermore. "The Lab had strong ties with Cornell," Shotts recalled. "Kent Johnson had been in my research group and I knew Steve Cochran."

At Cornell, Shotts made time to play pick-up basketball games in Barton Hall with groups of players, including Cochran, whom he remembers as having a "wicked outside shot."

Johnson, who served for nearly a decade as the chief of staff for the Defense and Nuclear Technologies associate director, met Shotts as they stood in line to register for fall classes for graduate school in physics in 1967.

"I remember being impressed that Wayne would leave California to come up to semi-frigid Cornell, where the sun goes to die," Johnson said. "Little did I know I was standing next to a 'national treasure,'" he quipped.

The two Cornell graduates were both hired into LLNL's A Division and had offices across the hall from each other.

"We were on the same teams for a number of nuclear tests and our calculations were often interrelated. Wayne has always been a hard worker, with great insights, careful and creative," Johnson said.

During Shotts' Lab career, he rose



JACQUELINE MCBRIDE/NEWSLINE

Wayne Shotts

through the ranks to become a group leader and then a program leader in the Lab's nuclear design department as well as division leader for nuclear chemistry and prompt diagnostics. In 1988, he became principal deputy associate director for military applications. In 1992, he joined the Defense and Nuclear Technologies directorate as principal deputy associate director. In the last two positions he worked on studies of the future of the weapons complex and the early framework for the Stockpile Stewardship Program.

"One of the special characteristics of the Laboratory is that scientists and engineers have the opportunity to do so many challenging projects that they never would have imagined in college," Shotts said.

In the late 1980s, Shotts supported the Director's Advisory Committee appointed by Director John Nuckolls, which included former Lab Director Johnny Foster, future CIA Director John Deutch and future Secretary of State Condoleezza Rice. A task force that Shotts led, including Ron Cochran and Bill Shuler, suggested new approaches for preserving the scientific and technical capabilities for the national laboratories' weapons programs.

In 1990, he received the E. O. Lawrence Award for National Security for his contributions to the research and development of advanced nuclear weapons and his innovative approach to improving diagnostic methods, which assisted in solving some of the most

pressing problems in nuclear explosive designs.

Years later, Shotts and Steve Cochran would work together in the Nonproliferation, Arms Control, and International Security (NAI) directorate, with Cochran serving for a decade as Shotts' "right-hand man," the directorate's deputy associate director for programs.

"Our careers have had many parallels," Cochran said. "We both graduated from Cornell in the 1970s. We both hired into the nuclear weapons program and led divisions there. We both became deputy associate directors for George Miller. But it wasn't until Wayne came to lead NAI that I worked closely with him."

I have the greatest admiration for Wayne," added Cochran, who retired last June. "He epitomizes 'passion for mission,' and it was no accident that he wrote up a column on that Laboratory value. He is incredibly driven to success and has an unerring sense for technical excellence. He conveyed that through his now-infamous 'dry runs' of every presentation that represented NAI."

Shotts started his second career — as the leader of NAI, the directorate developing most of the Lab's counterterrorism technologies and systems — in November 1995.

"Nonproliferation was fascinating to me," Shotts recalled. "I participated in meetings in Z Division. When Bob Andrews stepped down (as the head of NAI), it seemed like an ideal opportunity."

During Shotts' tenure, NAI grew from a budget of about \$98 million and 410 employees in 1995 to its current budget of more than \$300 million and some 865 employees. But, in Shotts' view, a measure even more important than NAI's growth is the Lab's impact and influence in the counterterrorism and homeland security arena.

"Wayne has always been willing to take a chance on new ideas and new directions," said Don Prosnitz, the deputy associate director for NAI. "These directions may have been foreign to the Lab but he realized they were critical to protecting the country. Most bosses would have said 'we don't do that' and sent us

SCIENCE NEWS

Lab helps prepare for biological attack on public facilities

By Stephen Wampler  
Newslines staff writer

In the future, the nation will be better prepared for biological pathogen terrorist attacks against airports and other transportation facilities.

This improved readiness is thanks to a project funded by the Department of Homeland Security (DHS) and led jointly by Lawrence Livermore and Sandia national laboratories.

Late last month, a two-day demonstration event was held at San Francisco International Airport’s Terminal 2 for about 120 officials from around the nation to lay out the response and restoration protocols that would be undertaken if a biological attack occurred.

The demonstration was the culmination of the three-year interagency collaborative effort focused on critical transportation facilities.

Among those attending were representatives and key collaborators from the U.S. Environmental Protection Agency, Centers for Disease Prevention and Control, San Francisco Department of Public Health, Defense Department, Defense Advanced Research Projects Agency, BART, California Environmental Protection Agency and key personnel from other airports (O’Hare International, Dallas-Fort Worth and Los Angeles International).

Under the Bio Restoration Demonstration Project, LLNL and Sandia researchers developed restoration plans and demonstrated how airports hit by biological terrorist attacks such as anthrax could be quickly decontaminated and reopened. As part of the demonstration, personnel donned haz-mat gear, and analyzed areas of the terminal based on a mock scenario supplied by the FBI.

“A deliberate bioattack on an airport could have far-reaching impacts, not only in terms of public health but also in economics,” said LLNL’s Ellen Raber, a principal investigator on the project. “This project is all about being better prepared to respond quickly and effectively while protecting human health and the environment.”

San Francisco International Airport was a partner in the three-year study. The national lab researchers used SFO’s facilities to evaluate what would need to be done to restore an airport and how to minimize impacts on airport operations.



BUD PELLETTIER/SANDIA

Biological samples are gathered during a mock incident at San Francisco Airport designed to demonstrate cleanup procedures and protocols.

Raber’s co-principal investigator, Sandia senior scientist Mark

Tucker, stated that many of the ideas developed through the project could apply to the nation’s other airports and other transportation systems, such as subways.

“One of the aims of the effort has been to use SFO as a case study to transfer lessons learned, templates and technologies to other airports,” Tucker said.

“This demonstration project successfully integrated technologies and protocols, addressing many of the requirements that the Department of Homeland Security had identified as critical needs for airport restoration in the unfortunate event of a biological attack,” said Elizabeth George, the DHS deputy director for Biological Countermeasures.

Included in the airport restoration templates are: protocols for characterizing an area through sampling and analysis after an attack; decontamination options; approaches for allowing public re-use of facilities and the possible application of longer-term monitoring.

As a part of the approximately \$10 million DHS project, researchers at Sandia and LLNL upgraded technologies to help shorten the cleanup times after a biological attack. Among the advances that were demonstrated at the airport were:

- LLNL researchers have developed a rapid viability test procedure to determine

whether anthrax spores are dead or alive within hours, rather than days, a capability that will greatly assist in the decontamination process by shortening cleanup timelines.

- A team of Sandia scientists has developed a Geographic Information System-based indoor sample tracking system called the Building Restoration Operations Optimization Model (BROOM). The system permits public health authorities to collect samples in a more efficient manner, to manage the large amount of data associated with samples collected from a contaminated facility, and to visually display the extent of any biological contamination. Sandia’s BROOM decision support tool, said Tucker, is one of three technologies recently selected for the DHS Science and Technology directorate commercialization pilot program.
- Sandia and LLNL have developed sampling methodologies to better understand the percentage of anthrax spores collected in samples (so public health authorities will have more knowledge about the extent of a contaminated area). This work also focused on how to sample more effectively using more statistical-based approaches for evaluating cleanups.

LLNL’s project effort also included the initiation and coordination of a 2005 National Academy of Sciences report that provides a framework for the decontamination of public facilities, such as airports, and other buildings in the wake of a biological attack.

The academy’s National Research Council convened a committee of experts to consider the criteria that must be met for cleanup of a biologically contaminated area to be declared successful, thus allowing reoccupation of the facility.

Called the “Reopening of Public Facilities After a Biological Attack: A Decision-Making Framework,” the report was a \$1 million, two-year effort conducted by a prestigious committee of biosafety experts, research scientists, medical consultants and environmental experts.

In 2005, a workshop was held in San Ramon, sponsored by DHS, EPA and CDC and facilitated by LLNL, focusing on preparedness activities for response and restoration for three airports — Seattle-Tacoma, LAX and SFO. There are plans to hold a similar workshop this year on the East Coast.

“This project is all about being better prepared to respond quickly and effectively while protecting human health and the environment.”

— ELLEN RABER

LABORATORY NEWS



“People want to know exactly what threats exist to them and to their specific work group. . . .”

Terry Turchie, manager of SAFE.

SAFE serves as model counterintelligence program

By Jeff Morris  
SAFE Program

It was February 1986. “Top Gun” was destined to be the top movie of the year. The Chicago Bears had just won Super Bowl XX, trouncing the New England Patriots. The Titanic had been found just a few months earlier.

The world was between the Challenger disaster in January and Chernobyl in April. Terrorists had gotten the world’s attention only months before by hijacking the Italian cruise ship “Achille Lauro,” and attacking the Rome and Vienna airports.

The previous year had become known as “The Year of the Spy,” with an unprecedented 11 Americans, all U.S. government workers, arrested for spying on their country.

President Ronald Reagan took action, issuing a mandate requiring all government agencies, including DOE, to establish their own security awareness programs. These programs would enlist all government employees to be the eyes and ears of the nation’s counterintelligence and counterterrorism efforts.

The rationale was that if coworkers of the 11 American spies had recognized the pattern and brought their concerns to someone they could trust and who would listen, it is likely that the loss of critical national defense secrets would have been prevented.

On Feb. 11, 1986, the LLNL Director’s Office rolled out the Security Awareness for Employees program.



SAFE’s 20th anniversary activities

- Classified threat briefings to all cleared employees (throughout the year).
- Videotapes to appear on LLTN (Channel, date, and time to be announced):
  - “Spy Tech: The real 007”
  - “Spy Tech: The Deadly Game”
  - “Doing the Right Thing, When It’s the Hardest Thing To Do,” by David Kaczynski, brother of the “Unabomber”
  - “Secrets, Lies, and Atomic Spies”
  - “History Undercover: Cyberterrorism”
- Counterintelligence classes (late 2006)

“Since then, SAFE has served as the model counterintelligence program for the Department of Energy,” said Terry Turchie, the fourth and current manager of SAFE.

SAFE immediately captured the interest of Lab employees. The program brought in top-notch speakers from the intelligence and counterintelligence communities, including FBI, CIA and NSA, and former KGB officers.

Briefings are the second component of SAFE’s awareness efforts.

“People want to know exactly what threats exist to them and to their specific work group,” said Turchie. “That’s why this year we are planning to lay these threats out in classified threat briefings to

individual groups at the Laboratory.”

Turchie said, “Employees need to know that when they come forward with a concern, the information they provide will be handled confidentially and professionally. They need to know that unsubstantiated allegations will be screened out and that only concerns that warrant investigation will be turned over to the FBI.”

The bottom line is that employees are the key to an effective counterintelligence and counterterrorism program, and that LLNL has one of the best such programs in the business.

For the full story, and for more information on SAFE, go to <http://www-rl.llnl.gov/safe/>. Contact SAFE at 2-5557.

# Harnessing DNA for bioenergy: Tapping nature’s building blocks to fuel the future

By David Gilbert  
Newsline staff writer

In his recent State of the Union speech, President Bush said technology is the best way to break the nation’s addiction to oil. The Department of Energy’s Joint Genome Institute (JGI) is bringing the technology of DNA sequencing to play in an effort to make alternative fuels cheaper and easier to produce.

At present, production of ethanol from cornstarch and biodiesel from various oil producing plants together account for only two percent of the U.S. fuel market. According to DOE, ethanol can replace 20 percent of the fossil fuel consumed for transportation by 2030, but this goal will require a different approach-conversion of biomass to ethanol. Biomass is any plant-derived material and is comprised of three main compounds: cellulose, hemicellulose, and lignin. During biomass conversion cellulose from plants is broken down chemically or enzymatically into simple sugars that are in turn fermented by bacteria or yeast into ethanol.

“Lignocellulosic materials, such as wood chips, crop residue and various grasses, have high energy content but the sugars are less readily available than those in cornstarch,” said JGI Director Eddy Rubin. “By directing DNA sequencing and the tools of molecular biology, we can survey the vast catalog of microbial biodiversity to improve the processes of converting these feedstocks to usable fuel.”

JGI, launched in 1997 to speed the completion of the Human Genome Project, now unites the expertise of five national laboratories, Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge and Pacific Northwest, along with the Stanford Human Genome Center. Even before the sequence of chromosomes 5, 16, and 19 were published by JGI in the journal *Nature* in 2004, it had set its sights on targets that factor prominently in DOE’s clean energy, carbon management and environmental clean-up missions. These include sequencing the genomes of dozens of microbes, including those that convert ethanol more efficiently and tolerate higher levels of ethanol, and those involved in degrading stubborn plant polymers. Most recently, JGI led an international effort to decode the first tree, the fast-growing poplar (see timeline).

Partnerships with hundreds of academic institutions have steadily driven the growth of JGI’s bioenergy portfolio. In November, JGI was selected to participate in the consortium of laboratories that will sequence corn, the leading U.S. ethanol fuel crop. In January, DOE put in place a memorandum of understanding with the U.S. Department of Agriculture to establish a framework for coordinated agency-relevant



DAVID GILBERT, NEWSLINE

Top left: Danielle Mihalkanin prepares to load samples into a DNA sequencer, one of more than 100 in use at the JGI Production Genomics Facility. Right: Arshi Khan prepares the ethanol used to rinse the magnetic beads for the clean-up step of the DNA purification process.



DAVID GILBERT, NEWSLINE

## Program provides access to DNA processing

In an effort to further articulate the Department of Energy national laboratories’ interests in leveraging JGI sequencing capacity, the Laboratory Science Program (LSP) will provide DOE national laboratory researchers broader access to high-throughput DNA sequencing for DOE mission-relevant projects.

The LSP will serve the national laboratories in two major ways. The first will be to foster large-scale, cross-national laboratory, strategic sequencing projects aligned with future funding opportunities in DOE’s biology programs. The second goal is to provide small-scale sequencing that meets the needs of individual investigators at the DOE National Laboratories. The LSP is expected to use 15 percent to 20 percent of JGI’s sequencing capacity (currently more than 35 billion bases per year).

The sequencing will target genomes of entire microbial communities, and individual microbes and plants, useful for converting plant materials to ‘green’ energy and chemical feedstocks, thereby decreasing reliance on petroleum.

An additional focus is on characterizing the variation in human susceptibility to nucleic acid damage by ionizing radiation.

More information on the LSP can be found at: <http://www.jgi.doe.gov/programs/LSP/index.html>.

changing hormones that control the distribution of carbon, the enzymatic pathways that shape the ratios of cellulose, lignin and the hemicellulose in the stem, and the transcription factors that regulate branching. These domestication steps, along with developing microbial-based bioreactors — communities that produce and tolerate high levels of ethanol — are the some of the low hanging fruits of technology.”

Another target of JGI’s bioenergy efforts is the termite, which is capable of cranking out two liters of hydrogen from fermenting just one sheet of paper, making it one of the planet’s most efficient bioreactors. Termites accomplish this by exploiting the metabolic capabilities of about 200 different species of microbes that inhabit their hindguts.

“Termites have spread throughout the world and play a critical role in recycling wooden biomass,” Rubin said. “They are so successful in eating our houses from underneath us that they cause more than \$1 billion in damage in the United States annually.”

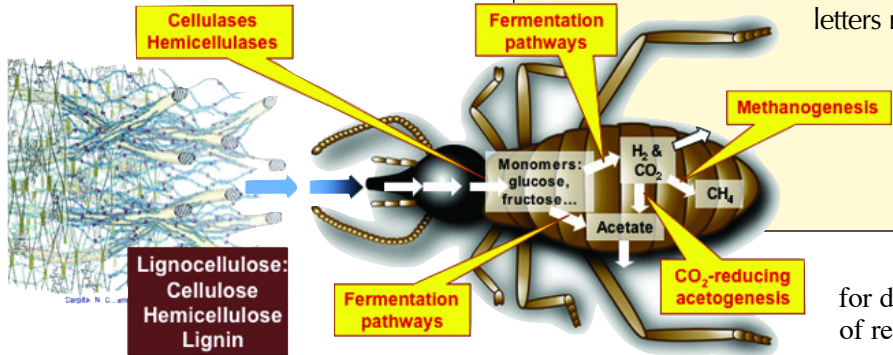
Because less than 1 percent of all microorganisms in the biosphere can be grown in the lab, JGI researchers Phil Hugenholtz and Falk Warnecke have had to tackle these critters on their own turf — in the jungle of Costa Rica. Through the emerging strategy of metagenomics-isolating, sequencing, and characterizing DNA extracted directly from the actual habitat — they are obtaining a profile of the “bugs” in the bug.

Termites eat wood, but they can’t extract energy from the complex lignocellulose polymers within it. These polymers are broken down into simple sugars by fermenting bacteria in the termite’s gut, using enzymes that produce hydrogen as a byproduct.

“It’s not as if we are going to put termites in our tank, but if we can harness the termite microbe enzymes that breakdown lignocellulose and make hydrogen, we may end up with a commercially viable process,” Hugenholtz said.

## What is sequencing?

SEQUENCING — Determining the order of the information embedded in the long microscopic strings of the letters, or nucleotides, G, A, T, and C, the shorthand for DNA sequence. Bound together Gs to Cs and As to Ts, these letters make up the rungs of the ladder of the DNA double helix. DNA sequence is the operating system for all living things — akin to the zeros and ones that encode the software running your computer.

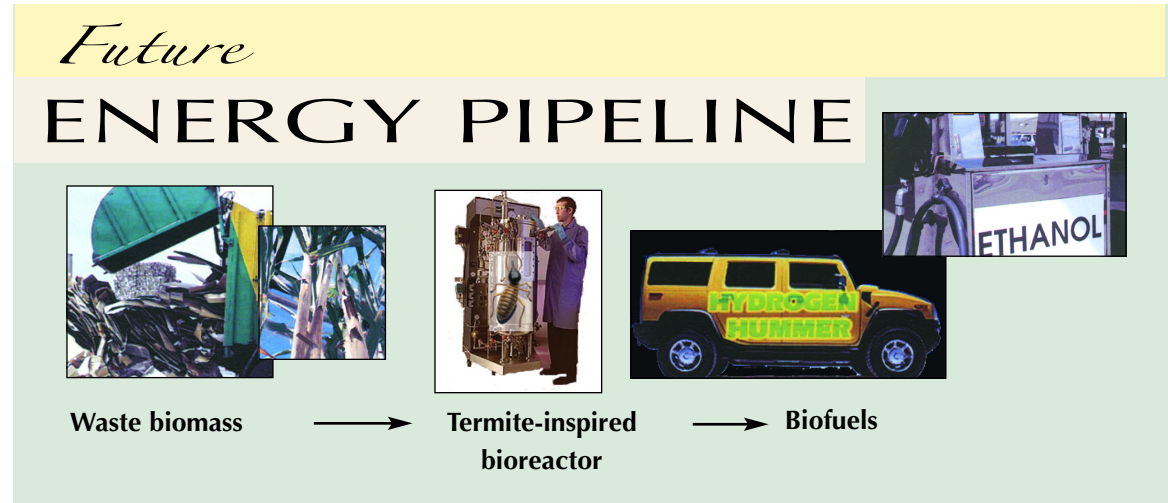


for doing this is native in soybean. We just need to find a way of regulating its development and expression in leaf tissue.”

### Poplar Possibilities and Termite Travails

Tuskan was among of the investigators, along with JGI’s Dan Rokshar, who led the poplar genome effort. “We now have the candidate genes that will help us domesticate poplar for biomass and reduce the cost from \$50 to about \$20 per ton,” said Tuskan.

“Lignocellulosic biomass is inherently resistant to deconstruction. If we could gain a better understanding of cell wall biosynthesis, then we could devise strategies for better cell wall deconstruction. Even greater gains in domestication are coming from



## THE JOINT GENOME INSTITUTE

1986	1990	1997	1998	1999	2000	2001	2002
• DOE invests \$5.3 million in pilot projects at the DOE national laboratories to develop resources and technologies to sequence the human genome.	• DOE and NIH present their joint Human Genome Project (HGP) plan to Congress; the 15-year project formally begins.	• DOE creates the virtual Joint Genome Institute (JGI), uniting DNA sequencing activities at LLNL, LBNL and LANL.	• JGI sets priority to submit 20 million units of unique DNA sequence (“bases”) in the year to GenBank.	• JGI dedicates new production sequencing facility in Walnut Creek, Calif.	• HGP leaders and President Clinton announce completion of a “working draft...the first great technological triumph of the 21st century.” JGI sequences the “Supergerm” in just one day.	• JGI leases VISTA-Visualization Tools for Alignments.	• JGI publishes the genomes of <i>Fugu rubripes</i> — the Japanese pufferfish and <i>Ciona intestinalis</i> , a common sea squirt, in the journal <i>Science</i> .
					• JGI sequences 15 microorganisms in a single “microbe month.”	• JGI and HGP members publish working draft of the human genome in <i>Nature</i> .	

## History at a glance

2004	2005	2006
• JGI sequences a community of microbes isolated from Iron Mountain, Calif. Acid mine drainage Superfund site, its first “metagenomics” project.	• Achieves 3.1 billion base level of productivity, the equivalent of generating one human genome’s worth of sequence in one month.	• Receives over 230 letters of intent for 2007 Community Sequencing Program Projects.
• JGI publishes in <i>Science</i> the genome of a diatom <i>Thalassiosira pseudonana</i> .	• Launches IMG: the Integrated Microbial Genomes (IMG) data management system.	• Launches Laboratory Science Program.
• JGI sequences the genome of a diatom <i>Thalassiosira pseudonana</i> .	• Adds Oak Ridge and Pacific Northwest National Laboratories to the fold through an MOU.	• Surpasses 12 billion bases sequenced from some 360 different genomes.
• JGI sequences the genome of a diatom <i>Thalassiosira pseudonana</i> .	• JGI sequences the first tree genome: <i>Populus trichocarpa</i> , the black cottonwood or poplar.	
• JGI sequences and publishes the genome of White rot fungus, in <i>Nature Biotechnology</i> .		

SCIENCE NEWS

Water shortages likely from global warming

By Anne M. Stark  
Newsline staff writer

If the world continues to burn greenhouse gases, California may have an increased risk of winter floods and summer water shortages, even within the same year. This scenario may be more severe in future El Niño years.

New research by Laboratory scientists shows that global warming is likely to change river flows in ways that may result in both increased flood risk and water shortages. The predictions assume atmospheric carbon dioxide concentration doubles from preindustrial levels.

The amount of water flowing in California’s rivers needs to be just right. Too much brings a risk of flooding; too little causes reservoir levels to drop.

As temperatures warm as a result of carbon emission, more rain than snow falls at higher elevations. For the areas that do receive snow, melt occurs sooner. The research shows that this well-known scenario — in which global warming causes an increase in wintertime river flows and a reduction in spring and summer flows — is more robust than previously thought.

“It seems unlikely that any changes in precipitation will be large enough to eliminate these problems,” said Philip Duffy, a Lab physicist and director of the Institute for Research on Climate Change and its Societal Impacts, a University of California Intercampus Research Program. Furthermore, in an El Niño (a naturally occurring climate fluctuation) season, these problems may be more severe.

California’s water infrastructure is very efficient at providing an adequate water supply and minimizing flood risk. The system, however, works well only in a climate that includes large amounts of mountain snow. Melting snow keeps reservoirs full in the late spring and summer, after rain and snowfall have stopped. Snow acts as a natural reservoir, with a volume close to that of manmade reservoirs.

As global warming ensues, more precipitation will be in the form of rain rather than snow. Also,



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A waterfall on the North Fork of the American River, in the foothills of California’s eastern Sacramento Valley.

what snow remains will melt earlier in the year. These changes will result in higher river flow rates in California’s major rivers during winter and lower flows during spring and summer, when flows are largely from snowmelt.

“Even if total flows over the whole year are the same, these changes could jeopardize water supplies, because it may not be possible for reservoirs to capture the increased winter flows,” said Edwin Maurer, a professor at Santa Clara University and lead author of the research that

appears in the Jan. 27 edition of the journal *Geophysical Research Letters*.

“This problem would be compounded by an increased risk of wintertime flooding resulting from higher river flow rates,” he said.

This would force water managers to reduce reservoir water levels to provide extra space for capturing increased winter flood surges, which would further reduce the overall year’s water supply.

“In an El Niño year, which brings more rain than a typical year, there would be an increase (versus today) in the year-to-year variability in river flow rates, which would make life complicated for people who manage the water supply,” Duffy said.

The researchers simulated only monthly mean river flows, so they can’t quantitatively assess flood risk, which depends on daily-timescale river flows. However, the monthly flows are high enough to indicate that flood risk would be much higher.

“In particular, there will be increased wintertime river flows and lower spring and summer flows whether future precipitation increases or decreases modestly,” Maurer said. “It seems unlikely that the potential problems can be avoided by changes in precipitation.” This finding was published earlier this year by Maurer and Duffy.

The newest paper by Maurer, Duffy, and Seran Gibbard of LLNL’s AX Division investigates effects on California river flows of a hypothetical future-climate El Niño. El Niño is a naturally occurring climate oscillation that typically produces increased precipitation, river flows and flood risk in California.

The team’s work has some limitations: The researchers assumed that the strength of an El Niño, as measured by departures of sea-surface temperatures from long-term average values, will be the same in the future as today. They did this because climate models don’t agree on how the strength of an El Niño is likely to change.

Expanding Your Horizons (EYH) in Math and Science Career Conference for Girls

The “Expanding Your Horizons” (EYH) conference is scheduled for Saturday, Feb. 25 at SBC Administrative Center in San Ramon.

The annual event aims to increase the interest of middle and high school girls in math and science through hands-on interactive workshops, a career fair and positive role models.

The event’s organizing sponsors are LLNL and Sandia National Laboratories.

For more information or to register, go to the Web at [http://www.llnl.gov/eyh/tv\\_eyh.html](http://www.llnl.gov/eyh/tv_eyh.html)

Postdoc program is ‘central to Lab’s future’

By Linda Lucchetti  
Newsline staff writer

They hail from universities around the country and the world. Their studies range from genetics to chemical engineering. They conduct leading-edge scientific research in collaboration with notable scientists. They are the Lab’s postdoctoral researchers or ‘postdocs.’

Currently, 148 postdocs are hard at work as research associates in the Biosciences, Chemistry & Materials Science (CMS), Physics & Advanced Technology (PAT) and Energy and Environment (E&E) Directorates. They arrive at the Lab through a variety of avenues — some selected for prestigious posts like the Lawrence Fellowship, the Herb York Fellowship or the Harold C. Graboske, Jr. Postdoctoral Fellowship offered through the Chemistry and Materials Science Directorate. Some are employed through the Student Employee Graduate Research Fellowship (SEGRF) Program.

Whichever path they choose, once here, they quickly become integral contributors to scientific research being conducted at the Laboratory — publishing research in journals, presenting seminars, giving scientific talks and attending conferences.

A vital component of the postdoc experience lies within a governing body — the Postdoc Advisory Council. Chaired by Lori Souza, Chemistry and Materials Science Directorate’s deputy associate director for operations, the committee established in 1999 is comprised of a cross section of representatives from directorates that employ postdocs.

“It’s inspiring to work with these exceptional young scientists,” Souza says. “The council is really the thread that connects the postdoc community, providing better organization to the overall program and sharing best practices. We offer the postdocs a variety of tools, such as orientation to LLNL, career development sessions and postdoc networking groups.”

The council meets once a month and reports directly to Cherry Murray, the Lab’s deputy director of Science and Technology.

“The Postdoc Advisory Council is essential to the standardization of processes across the Laboratory as well as a means for sharing best practices,” Murray says.

Why do postdocs pick Lawrence Livermore? Most say

that it is the Lab’s reputation for doing “big science” that attracts them.

In a survey conducted in 2004 by *The Scientist* magazine, the Lab was ranked seventh among 61 U. S. institutions as one of the nation’s best workplaces for postdocs. More than 3,000 researchers were surveyed from Western Europe, Canada and the U.S., and asked to rate institutions based on workplace factors such as access to publications and journals, high quality research tools, scientific career

preparation, communication, collegiality and quality research.

Recruiting postdocs for full time positions is important to the future of the Lab.

Over the past five years, more than 200 postdocs have switched appointment status as their terms ended to sign on as either indefinite or flex-term employees.

“The postdoc program is central to the Lab’s recruitment pipeline and its future,” Murray said.

IN PROFILE

Nir Goldman is a third year postdoc working in the Chemistry and Materials Science Directorate. He was raised in Los Alamos, New Mexico, and attended Yale University for his undergraduate work. He came west to attend UC Berkeley for a Ph.D. in chemistry.

He claims that there was never a doubt about selecting LLNL. What was a selling point?

“The big computers,” he answers without hesitation. “These are the tools I use to conduct research.”

Goldman’s work in the area of computational physical chemistry involves analyzing water and liquids under extremes conditions, inside planets. “This ultimately challenges scientists to look at bonding and chemistry in a novel way,” he says.

Goldman thinks that the Lab is a good place to work. “Everyone here is very excited about what they are doing. There is a real collaborative environment here.”

Evan Reed is in his second year of a Lawrence Fellowship, a prestigious postdoc program that encourages cutting-edge science and cross-fertilization of ideas. A physics major from Minnesota, Reed graduated from Caltech in Pasadena and received his Ph.D. from MIT. His research involves shock wave modeling and the optical phenomena that occur when propagated through crystalline materials like sodium chloride.

“Under some circumstances, you can observe coherent radiation,” he explains. Reed made this prediction and he and team members received an LDRD to conduct experiments to look for the effect. An article on the study was published in *Physical Review Letters*.

As a Lawrence Fellow, Reed is affiliated with the University Relations Program (URP) but works in the Chemistry and Materials Science Directorate. Why did he apply for a fellowship position at Livermore? Reed said that he has had a lengthy association with LLNL. He was summer student here for six summers and liked the environment.

“Basically, in certain key areas, the Lab has many things to offer that you can’t find anywhere else — like access to the fastest computers.” Reed went on to say that at the Lab, researchers can do new and creative things, and have freedom to explore.

What’s the next step for Reed when his 3 year fellowship ends? “My job here is so good. This might be as good as it gets,” he says, noting that the fellowship allows him to pursue world class research with ample



Nir Goldman

resources.

Anne Clatworthy is an immunologist who is enjoying her time as a postdoc at the Lab. She works in the Biodefense area of Biosciences with mentor Sandy McCutchen-Maloney. Clatworthy’s research, funded through the Department of Homeland Security, involves analyzing virulence factor induction in *Yersinia pestis*.

Clatworthy came west from Harvard University and prior to that, spent two years working at Massachusetts General Hospital. She said that the Biosciences postdoc group offers many organized activities.

“Having a network of postdocs in Biosciences is very helpful,” Clatworthy says. The group meets quarterly for lunch, participates in seminars on such topics as grant writing and also conducted its first symposium this last summer.

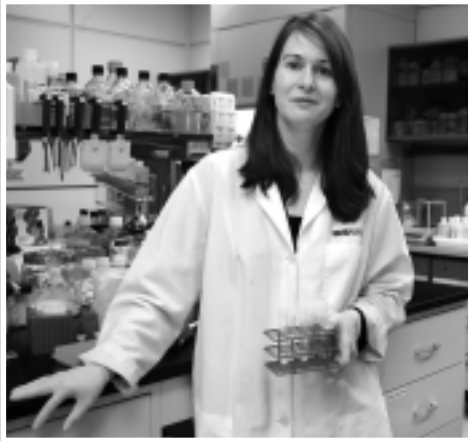
“I like being exposed to more applied science here at the Lab,” Clatworthy adds, “and the opportunity to collaborate with scientists in other directorates that have very different areas of expertise from my own has been exciting.”

Clatworthy said that she feels very comfortable as a woman in science at LLNL.

“In the Bioscience Directorate, I have felt that there is a nice camaraderie. It is also very encouraging to have a role model like Cherry Murray in such a prominent position at the Lab.”

Hope Ishii is a postdoc in the Physics and Advanced Technologies (PAT) Directorate, working in the Institute for Geophysics & Planetary Physics (IGPP) under the mentorship of John Bradley, IGPP Director.

Ishii has a Ph.D. from Stanford University, and training as a materials scientist. You may have heard about her current project. She has been working on technical developments for extraction and analysis for cometary particles captured in aerogel by NASA’s Stardust mission, a program that has been in the news lately and has placed her in



Anne Clatworthy

the spotlight.

“It’s very, very exciting,” Ishii said. The Stardust mission was launched seven years ago and the sample-return capsule landed in the Utah desert after a fiery re-entry Jan. 15. Ishii hand-carried the comet samples back from NASA’s Johnson Space Center on a commercial flight shortly after.

“Basically, the samples are cosmic dirt,” she explains. “It’s been frozen since our planetary system formed four and half billion years ago. This is like a time capsule for us.”

Ishii developed an ultrasonic diamond blade to extract the dust particles out of the aerogel in which they are embedded. The particles are being analyzed by the world’s most powerful electron microscope, magnified 100,000 times.

“This is a great advantage to working at LLNL. As an experimentalist, I have the ability to utilize some amazing equipment. This provides a tremendous resource. It makes doing good science here easier,” Ishii said.

She said that she chose LLNL for her post doc appointment because of the Lab’s ‘unrivaled reputation.’

“I would definitely encourage future post docs to consider the Lab. It is a place with a lot of smart people doing great science. There is a sort of cross pollination here — a diversity of people and projects.”

She said her Lab position is a “nice situation.” As a postdoc in the IGPP, she is able to interact with other post docs from many universities, while collaborating with outstanding Lab scientists.

With one year left to her postdoc program, she hasn’t decided what she’ll do next. “I’m looking around,” she says. No doubt, the Stardust mission has made a lasting impression.

“This is probably the one time in my life that I will have the opportunity to look at particles like this up close.”

inbrief

Update on Newsline classified ads

A new system for classified ads has tentatively been selected and is currently undergoing review by Laboratory Computer Security. The old system was decommissioned in December 2005 because it was too costly to make it compatible with the Laboratory’s upgraded administrative information systems. Look for additional information in upcoming editions of *NewsOnLine* and *Newsline*.

SCIENCE NEWS

# Volcanoes curbed global temperature rises

By Anne M. Stark  
Newsline staff writer

Ocean temperatures might have risen even higher during the last century if it weren't for volcanoes that spewed ashes and aerosols into the upper atmosphere, researchers have found. The eruptions also offset a large percentage of sea level rise caused by human activity.

Using 12 new state-of-the-art climate models, the researchers found that ocean warming and sea level rise in the 20th century were substantially reduced by the 1883 eruption of the Krakatoa volcano in Indonesia. Volcanic aerosols blocked sunlight and caused the ocean surface to cool.

"That cooling penetrated into deeper layers of the ocean, where it remained for decades after the event," said Peter Gleckler, an atmospheric scientist in the Lab's Program for Climate Model Diagnosis and Intercomparison. "We found that volcanic effects on sea level can persist for many decades."

Gleckler, along with colleagues Ben Santer, Karl Taylor and Krishna AchutaRao and collaborators from the National Center for Atmospheric Research, the University of Reading and the Hadley Centre, tested the effects of volcanic eruptions on recent climate models.

They examined model simulations of the climate from 1880 to 2000, comparing them with available observations. External "forcings," such as changes in greenhouse gases, solar irradiance, sulphate and volcanic aerosols, were included in the models.

Oceans expand and contract depending on the ocean temperature. This causes the sea level to increase when the water is warmer and to recede in cooler temperatures.

The volume average temperature of oceans

(down to 300 meters) worldwide has warmed by roughly .037 degrees Celsius in recent decades due to increasing atmospheric greenhouse gases. While seemingly small, this corresponds to a sea level rise of several centimeters and does not include the effect of other factors such as melting glaciers. That sea level jump, however, would have been even greater if it weren't for volcanic eruptions over the last century, Gleckler said.

"The ocean warming suddenly drops," he said. "Volcanoes have a big impact. The ocean warming and sea level would have risen much more if it weren't for volcanoes."

Volcanic aerosols scatter sunlight and cause the ocean surface temperature to cool, an anomaly that is gradually subducted into deeper layers, where it remains for decades.

The experiments studied by Gleckler's team also included the more recent 1991 Mt. Pinatubo eruption in the Philippines, which was comparable to Krakatoa in terms of its size and intensity. While similar ocean surface cooling resulted from both eruptions, the heat-content recovery occurred much more quickly in the case of Pinatubo.

"The heat content effects of Pinatubo and other eruptions in the late 20th century are offset by the observed warming of the upper ocean, which is primarily due to human influences," Gleckler said.

The research appears in the Feb. 9 issue of the journal *Nature*.



RICHARD P. HOBLITT/USGS

The June 12, 1991 eruption column from Mount Pinatubo, Philippines, as seen from Clark Air Base.



## The 'battle of the buzzers' begins

Jennifer Nelson-Childs, left, reviews competition rules with teams before a preliminary round of the second annual "African History Bowl," held this week in celebration of Black History Month.

The history bowl tests a team's ability to recall facts related to African and African-American history. The goal is to demonstrate the importance of history, bring together diverse teams, conduct a competition and have fun.

The seven directorate teams competing for a chance to go on to the final round are: Directors Office, NAI, DNT, PAT, Computation, AHRD and LSD. All Lab employees are invited to attend the final round on Feb. 28 in the Bldg. 123 auditorium, noon-1 p.m.

The Association of Black Laboratory Employees (ABLE), in association with the Laboratory's Worklife Program Office, is hosting the history bowl. For more information, contact Hanif Nassor-Covington at 3-5487.

JACQUELINE MCBRIDE/NEWSLINE

PEOPLE NEWS

## in MEMORIAM

### Marvin R. Smith

Marvin Richard Smith, who retired in 2001 after 23 years of service at the Lab, died Jan. 30 in his Oakland home. He was 64 years old.

Smith was the manager of the Lab's Business Affirmative Action Office, and a lifelong advocate for civil rights, fair housing, affirmative action and equal employment opportunities.

Born in Kansas City, Mo., Smith started his career as a Richmond police officer while attending Cal State Hayward. He graduated from Cal State and went on to receive a master's degree

from Golden Gate University. Between 1970 and 1977 Smith was manager of the Fair Housing and Equal Opportunity Compliance Division in the San Francisco office of the U.S. Department of Housing and Urban Development.

He was a member and officer of the National Black Police Association, a grand jury foreman, and the National Minority Business Advocate of the Year.

He is survived by his wife, Delores; children, Vincent, Gina and Ricky; two grandchildren; his mother, two sisters and three brothers.

### Kenneth Michael

Kenneth Michael, a Laboratory retiree, died Dec. 1 of cancer. He was 79.

Born in Bridgeport Neb., Michael spent his childhood in Fruitland, Idaho.

He served in the Navy during World War II. He worked at Hanford, Wash., and moved to the Bay Area in 1962. He began his employment at the Lab in 1962 and worked for 24 years in Electronics Engineering.

He retired in 1986 and moved to Las Vegas, Nev. with his wife.

Michael was preceded in death by his wife Phyllis who died two weeks prior.

He is survived by his three children Susan Diaz, Marsha McInnis and David Michael; daughter-in-law Miho Michael, son-in law Jim McInnis, nine grandchildren and three great-grandchildren.

A memorial service will be held at the Southern Nevada Veterans Memorial Cemetery in Boulder City, Nev. March 21.

### Robert "Bob" Strickland Sr.

Robert "Bob" Strickland, Sr., died at the Veterans Hospital in Martinez on Dec. 21, after a four-year battle with cancer. He was 84.

Born Oct. 22, 1921 in Independence, Kan., he was the only child of Edwin Louis and Lela Marguerette (Stockdale) Strickland. Both preceded him in death.

Strickland served in the U.S. Army Air Corps during World War II. In 1945 he joined the Air Force Reserves and was recalled in 1950 during the Korean War.

He worked for the Laboratory as well

as Lawrence Berkeley Laboratory, retiring in 1969. He owned and operated printing and pool companies, and managed a service station for a friend until age 65.

He enjoyed playing cards and pool. He enjoyed genealogy and did extensive research.

He is survived by his wife Carolyn; three sons, John Strickland, Sr. of Fresno; Kenneth Strickland of Roseburg, Ore.; Robert Strickland, Jr. of San Ramon; one daughter, Carolyn Neel of Galt; grandchildren and great-grandchildren.

### Carol Jean Podrasky

Carol Jean Podrasky of Ripon, a retired Laboratory employee, died Nov. 22 at Memorial Hospital in Modesto after a brief illness. She was 78.

Known to her family and friends as Jean, Podrasky was born in Bayard, Neb. She moved to Tracy in 1935 with her parents, Frank and Edna Hoyt, and her brother, Bob. She graduated from Tracy High School in 1944.

Podrasky lived in Livermore for 29 years, where she was a homemaker and volunteer at Valley Memorial Hospital.

Later, she worked as a buyer for LLNL's Plant Engineering Department, retiring after 10 years in 1989.

She was an avid traveler to Europe,

the Caribbean and around the United States, and also enjoyed playing cards.

Podrasky is survived by her husband, Joseph Podrasky of Ripon, who worked at the Lab for 36 years, retiring in 1990; children, Roger Noack, and his wife, Jean, of Chesapeake, Va., Cynthia Dipietro and her husband, Lawrence, of Livermore, Russell Noack and his wife, Elizabeth, of El Dorado Hills and Thomas Podrasky of Tracy; a brother, Bob Hoyt, and his wife, Mary, of Atascadero; nine grandchildren and four great-grandchildren.

Memorial contributions in her name may be sent to the St. Vincent De Paul Society, 505 E. North St., Manteca, 95336.

### Lloyd Clyde Higby

Lloyd Clyde Higby, a 35-year employee of the Laboratory, died Feb. 2 in Manteca. He was 71.

Born Sept. 26, 1934 in Chicago, Ill., he was a resident of Manteca for 19 years.

Higby was a supervisor in the Supply and Distribution Department, retiring in 1993.

He was a 38-year member of the Golden Anchor Boat Club and a long standing member of the Livermore Elks Lodge. His hobbies included camping, fishing, water skiing and working on cars.

He is survived by his wife of 50 years, Jean Higby; daughter and son-in-law Teresa and Bob Rochin of Livermore; sons and daughters-in-law Doug and Tonya Higby of Livermore and Ken and Diana Higby of Manteca; grandchildren Dan, Jimmy, Seth, Olivia and Jordan; and great-grandchild, Daniel.

Funeral services were held in Livermore. Donations may be made to the American Lung Association, 295 27th St., Oakland, 94612, or a charity of choice.

### Harry Brandt

Harry Brandt, professor emeritus of mechanical and aeronautical engineering at the University of California, Davis, died Jan. 28. He was 80.

Born in Amsterdam, the Netherlands in 1925, Brandt initially studied marine engineering during the World War because the program was not under the control of the German occupation. Later, he went into hiding to avoid conscription into the German Army.

In 1946 he immigrated to the United States and received his bachelor's, master's and doctorate degrees in mechanical engineering from UC Berkeley. He worked at Chevron Research in La Habra, Calif. for ten years before joining UC Davis in 1964 as a professor of mechanical and aeronautical engineering. He chaired the department twice, from 1969 to 1974 and from 1985 to 1991.

From 1997 to 2005 he was chairman of the board of Clean Energy Systems, a Sacramento-based firm set up to develop new technology based on rocket engines for gas-fired power plants.

He retired from the university in

1994, but continued to take an active role in mentoring younger faculty, graduate and undergraduate students, both at UC Davis and at LLNL. One of his achievements as professor emeritus was to establish the instructional television (ITV) program, which allows UC Davis students studying at the Laboratory to attend lectures given by professors in Davis.

Brandt enjoyed figure skating and gymnastics, and with his children built an ice-skating rink in his backyard. He also enjoyed the outdoors, bike riding and hiking and volunteered at the visitor's center at Sawtooth National Recreational Area, near Sun Valley, Idaho.

He is survived by his wife of 53 years, Muriel; daughter and son-in-law, Joyce and Craig Copelan of Winters; daughter Marilyn Brandt of Stewartville, N.J.; and a son, Robert Brandt of Santa Barbara.

Donations in his memory may be made to the American Cancer Society, University Covenant Church, Davis Community Church or the Yolo Hospice.

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## SHOTTS

*Continued from page 3*

packing, but he embraced and supported the new ideas. That's why today NAI is so strong and poised to lead the Lab for the next few decades."

Prosnitz fondly recalls the way Shotts pushed him to go to Washington D.C. — without consulting him first.

"I remember one spring morning that he informed me 'we have booked your plane tickets, and I have committed you to four months in DC on the science council,' — all without consulting me first. It was vintage Shotts, but it changed my career and I'm grateful for it. When I came home, he handed me a war bonnet, gave me the title of chief, and wrote a job description that said my job was to 'tell you what you needed to know but didn't want to hear.' Again, vintage Shotts!"

The Lab's efforts to develop technologies to counter terrorism were seen in the days after September 11, 2001. More than 60 Laboratory employees in a dozen different groups were deployed to New York City, Florida, Washington D.C. and other locations.

"The NAI staff rose to the occasion and went far beyond," Shotts said. "Every day after 9/11 we had employees coming to us with ideas and volunteering to work on homeland security."

It was during this time that Shotts developed his appreciation for the "passion for mission" shown by employees, prompting his column about this Lab value.

"September 11 had a fundamental effect on many of us and changed the direction of the country. It wasn't exactly the type of terrorist attack that we were anticipating — but it was a similar event."

In December 2002, the Laboratory established its Homeland Security Organization (HSO) to work closely with the U.S. Department of Homeland Security — and Shotts was named its acting director. During his tenure, HSO's budget (also within NAI) more than doubled to about \$100 million.

"Working in NAI and Homeland Security was simultaneously very stimulating and very stressful," said Lauren de Vore, who worked for Shotts for eight years, writing the NAI directorate's annual report, white papers and other communications.

De Vore recalls one of her

early encounters with Shotts as one of the more unusual — and best — job interviews she's ever had.

The two Lab employees happened to be flying home from Dulles International Airport on the same flight and ran into each other at the check-in counter. As they rode the shuttle to the terminal, Shotts and de Vore talked — and by the time the ride ended, de Vore had a new job.

"It was a lot of fun to try to put words in Wayne's mouth," de Vore said. "Sometimes Wayne would be so spun up during the 'dry runs' for presentations, we would replace the caffeinated coffee with decaf."

And it actually happened that way, notes Shotts' longtime executive assistant, Julie Cox, who started with him in October 1990, when he was the principal deputy in military applications.

Cox describes her boss as "hard-working, very focused, a perfectionist and someone who gives great attention to detail."

"Working with Wayne has been a challenge that's taken 15 years to master. I've learned a lot from him over the years. I was very intimidated working with him at first; he's a wonderful person. I'm very honored to have worked with him and for him to have taken me along with him on his career. I wouldn't have missed this opportunity for the world. I will miss him and our daily interactions."

"We started in Bldg. 111 and we're finishing in Bldg. 111," she added.

Shotts is ending his career as the Lab's deputy director for Operations, a job he took on in an acting capacity in October 2004 and assumed permanently in January 2005. He has managed all institutional operations at LLNL with responsibilities for such areas as safety, security, facility management and business practices.

"Safety is part of everything we do. So is security. Operations functions are enablers; they enable the institution to do its job. Operations are successful if they're not an issue," Shotts noted.

Now retirement beckons — though this is not the first time Shotts has attempted to leave the Laboratory. "I've been thinking about retirement since last summer," Shotts said. "I spoke with Mike about it and he asked me to stay on a bit longer. At the time, we had a number of vacancies and new senior management team members and continuity was

## Shotts led landmark Livermore Study Group

Wayne Shotts knows what it's like to serve on committees, councils, panels, boards, advisory groups and even task forces.

During his more than 30 years at the Laboratory, he served on more than a score of them.

Probably the important one for Shotts, the Laboratory and the nation came during his first year as the new associate director for Nonproliferation, Arms Control and International Security (NAI).

In 1996, the director of the Central Intelligence Agency (John Deutch) and the deputy secretary of Energy (Charles Curtis) chartered a study of the threat posed by terrorist groups using nuclear, chemical or biological weapons in the United States.

The investigation, dubbed the Livermore Study Group, was organized by Shotts and chaired by James Woolsey, a former CIA director, and Joseph Nye Jr. a former assistant secretary of Defense for International Security Affairs.

The study analyzed nuclear, chemical and biological attack scenarios, the consequences of such attacks, and how advanced technologies and systems might mitigate these threats.

"Where we once worked on individual technologies, after the Livermore Study Group, we started addressing goals and the development of overall systems to counter terrorist threats," Shotts said.

In the wake of the Livermore Study Group, the wide-ranging NAI programs were integrated into a single strategy. The directorate's aim, through its four divisions, has been to prevent proliferation and terrorism (P Division), detect and reverse it (Q Division), respond (R Division) and avoid surprise (Z Division).

important."

With the senior management council now in place and important progress made in Lab operations, Shotts felt the time was right to make his retirement move.

"My wife, Jacki, and I love to travel, and we have a mountain cabin, where we'd like to spend more time. I also hope to make time for more reading and writing."

Over the years, Shotts and his family have made a number of trips, including an April 2005 venture that he and his wife took to celebrate his 60th birthday. They traveled to Antarctica with Larry Woodruff, Shotts' longtime friend and former boss in military applications, and his wife, Sylvia. "Wayne got along very well walking sideways," Woodruff joked, noting that the waters between Antarctica and South America are some of the roughest in the world.

Over the past six months, Shotts and his wife have been mapping out their schedule for retirement with travel, a family wedding and photography and woodworking projects... and a four-month, "around the world" trip.

"I'm looking forward to a life of no business suits or meetings."

One area that looked particularly fruitful was rapid biological detection. The early detection of pathogens offered the chance to more effectively treat people. And, with the Human Genome Project, the Lab had unique capabilities.

An early NAI and Laboratory Directed Research and Development initiative, funded at about \$2.8 million for three years starting in 1996, focused on developing improved biological detection technologies. In 1999, Secretary of Energy Bill Richardson pledged that a biodefense system would be in place for the 2002 Winter Olympics in Salt Lake City.

A system developed by LLNL and Los Alamos researchers, called the Biological Aerosol Sentry and Information System (BASIS), was deployed there as part of the Olympics' security network.

"One of the early successes of BASIS was its integration into the national, state and local health networks," Shotts said. "It was about a systems approach, not about giving a detector to someone."

The various assays used by BASIS to detect pathogens were validated by the Centers for Disease Prevention and Control (CDC). The response protocol to be used in the event of a positive detection was developed working with local, state and federal agencies.

Over the last decade, Livermore's early biodefense effort has grown into a \$60 million per year Chemical and Biological National Security Program. Lab researchers have won R&D 100 awards for three straight years for developing biodefense instruments.

"The work by our employees in NAI and HSO to help protect the nation against terrorism is one of the efforts of which I am most proud," Shotts said.



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